National Hurricane Program

Delmarva Hurricane Evacuation Study
Transportation Tools Workshop

Ma 10

FEMA

UNIT 1

Course Overview

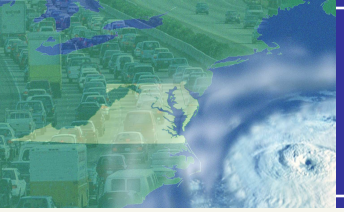
Introduction to the Delmarva ATM

COURSE OBJECTIVE

Demonstrate a basic understanding of the use of the Delmarva ATM

Understand how model outputs or results may be used in HURREVAC

Upon course completion, participants should be able to train other users in the use of the ATM



STUDENT INTRODUCTIONS

Names, job titles, and organizations

Overall experiences with evacuation planning or emergency response

STUDENT EXPECTATIONS

What do you expect to gain from this course?

INSTRUCTOR EXPECTATIONS

Cooperate with the group

Be open minded to new ideas

Participate actively in all of the training activities and exercises

Return to class after beaks at the stated time

Use what you learn to support your organization's role in emergency

COURSE STRUCTURE

Unit 1: Course Overview

Unit 2: Hurricane Evacuation Study Process

Unit 3: Basic Features of the Delmarva ATM

Unit 4: Data Entry Modules - *Demonstration*

LUNCH BREAK

Unit 5: Data Results Modules - *Demonstration II*

Unit 6: Consequence Management Module - *Exercise I*

Unit 7: HURREVAC Integration - *Exercise II*

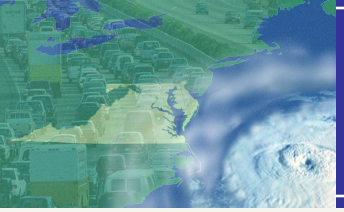
COURSE LOGISTICS

Course agenda

Sign in sheet

Housekeeping issues:

- Breaks
- Emergency exits / special access requirements
- Cell phone policy
- Facilities
- Other concerns



COURSE COMPLETION

Participate in all unit activities / exercises

Complete unit capstone quizzes

Complete the end-of-course evaluation

The Hurricane Evacuation Study (HES) Process

UNIT OBJECTIVES

Understand the background and components of the Delmarva Hurricane Evacuation Study

Identify the steps in the evacuation planning process

- **Step 1: Establish Evacuation Zones**
- **Step 2: Establish Evacuation Roadway Network**
- **Step 3: Collect Demographic and Behavioral Data**
- **Step 4: Generate Evacuation Statistics**
- **Step 5: Distribute Evacuation Trips**
- **Step 6: Identify Vehicles by Roadway Segment**
- **Step 7: Calculate Clearance Times**

Define evacuation clearance time and understand its components

BACKGROUND AND COMPONENTS

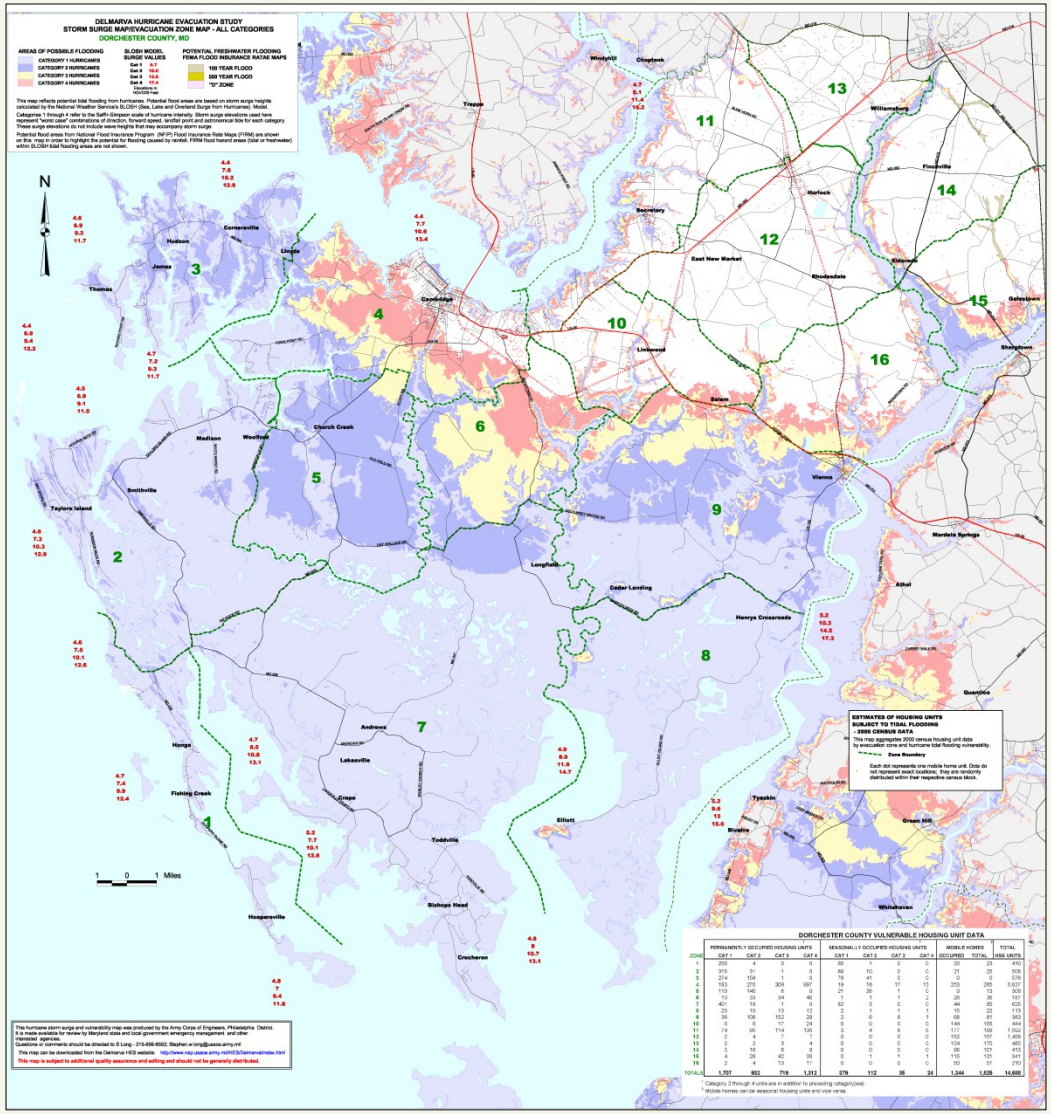
Completed in February 2007

The Delmarva HES:

- Provides a calculation of clearance times by county for inclusion in HURREVAC
- ATM allows users to model different scenarios “on the fly”
- ATM includes a Consequence Management Module that analyzes traffic volume at four locations

EVACUATION PLANNING PROCESS

Establish Evacuation Zones

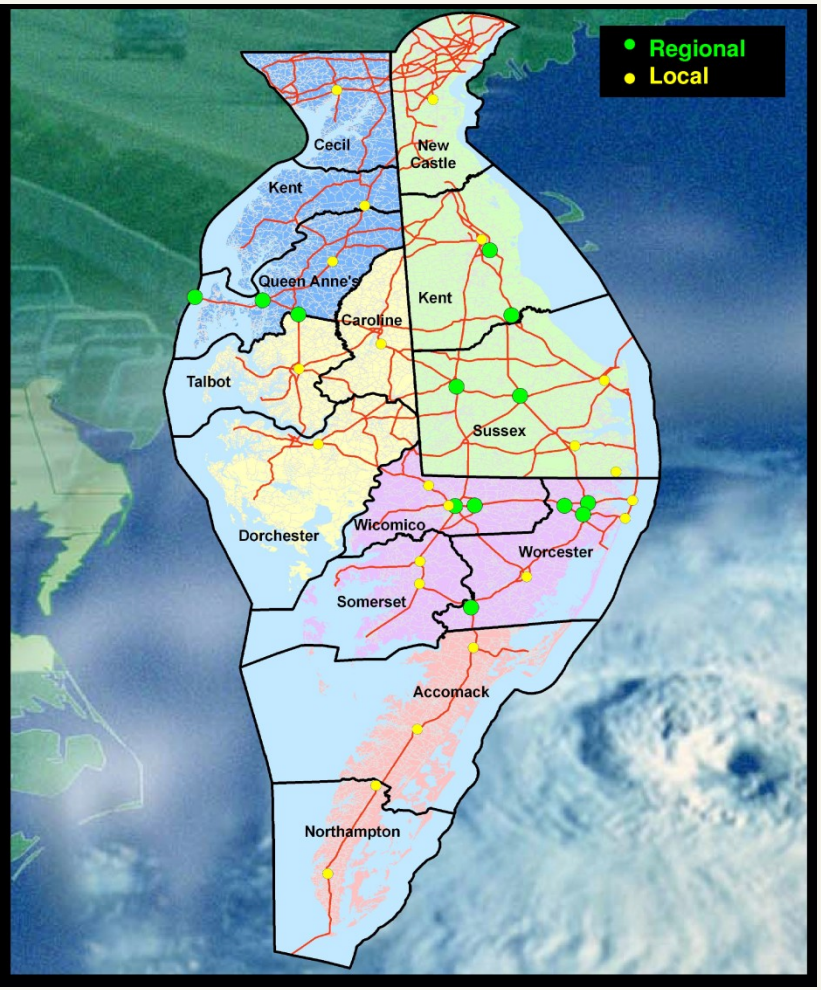

DELMARVA HURRICANE EVACUATION STUDY
STORM SURGE MAP/EVACUATION ZONE MAP - ALL CATEGORIES
DORCHESTER COUNTY, MD
AREAS OF POSSIBLE FLOODING
CATEGORY 1 HURRICANES
CATEGORY 2 HURRICANES
CATEGORY 3 HURRICANES
CATEGORY 4 HURRICANES
SLOSH MODEL SURGE VALUES
POTENTIAL FRESHWATER FLOODING FEMA FLOOD INSURANCE RATE MAPS
100 YEAR FLOOD
500 YEAR FLOOD
"D" ZONE
N
1 0 1 Miles
ESTIMATES OF HOUSING UNITS SUBJECT TO TIDAL FLOODING - 2000 CENSUS DATA
DORCHESTER COUNTY VULNERABLE HOUSING UNIT DATA

Establish Evacuation Roadway Network

Evacuation Network
Regional Focal Points

Regional Focal Points:

- US 13/US113 at Pocomoke City
- Route 90/US50 west of Ocean City
- Route 90/US113 west of Ocean City
- US 50/US 113 west of Ocean City
- US 50/US 13 Bypass east of Salisbury
- US 50/US 13 at Salisbury
- Route 404/US 50 near Wye Mills
- US 50/US 301 near Queenstown
- WM Preston Lane Jr Memorial Bridge
- Route 404/US 113 near Georgetown
- Route 404/US 13 at Bridgeville
- Route 1/US 113 north of Milford
- Route 10/Route 1/US 13 near Dover



EVACUATION PLANNING PROCESS

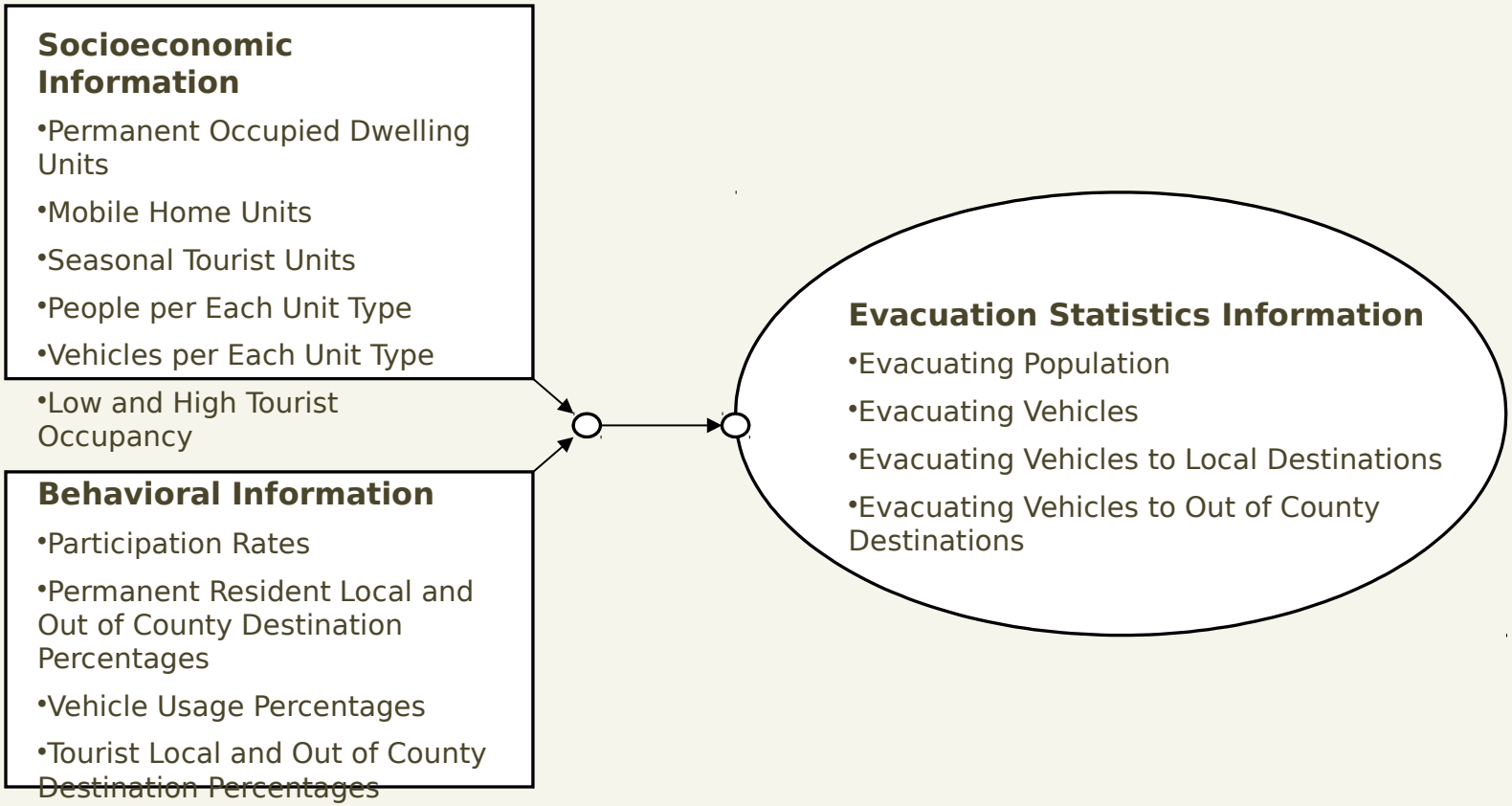
Collect Demographic Data

- Population data was obtained from the 2000 Census
- Tourist data, including campgrounds was obtained by the Army Corps of Engineers in coordination with the State and local governments

Collect Behavioral Data

- A behavioral study was conducted for the Delmarva region

Generate Evacuation Statistics


Socioeconomic Information
•Permanent Occupied Dwelling Units
•Mobile Home Units
•Seasonal Tourist Units
•People per Each Unit Type
•Vehicles per Each Unit Type
•Low and High Tourist Occupancy
Behavioral Information
•Participation Rates
•Permanent Resident Local and Out of County Destination Percentages
•Vehicle Usage Percentages
•Tourist Local and Out of County Destination Percentages
Evacuation Statistics Information
•Evacuating Population
•Evacuating Vehicles
•Evacuating Vehicles to Local Destinations
•Evacuating Vehicles to Out of County Destinations

EVACUATION PLANNING PROCESS

Distribute Evacuation Trips

- Destination routing informed by state tourist data

Indentify Evacuating Vehicles By Roadway Segment

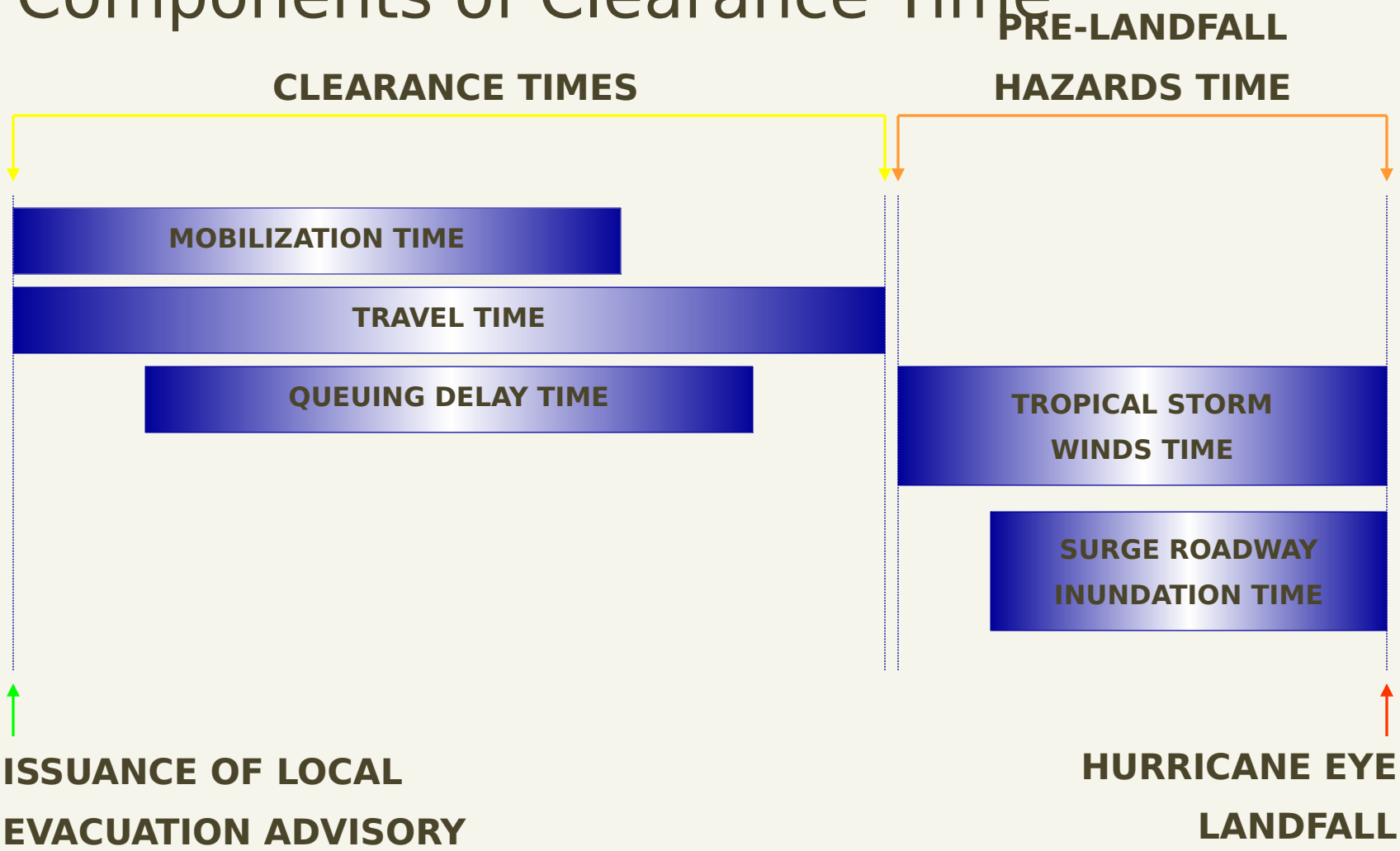
- Vehicles routed through to peripheral destinations

Calculate Clearance Times

- High / low tourist occupancy; fast, medium and slow response time

EVACUATION PLANNING PROCESS

Components of Clearance Time



UNIT 2 – CAPSTONE QUIZ

Identify the main components of the 2007 Delmarva HES

List the seven steps in the evacuation modeling process

Define clearance time

UNIT 2 – SUMMARY

The 2007 Delmarva HES provides estimates of clearance times and includes an ATM with a Consequence Management Module

The seven steps in the evacuation modeling process include;

Step 1: Establish Evacuation Zones
Step 2: Establish Evacuation Roadway Network
Step 3: Collect Demographic and Behavioral Data
Step 4: Generate Evacuation Statistics
Step 5: Distribute Evacuation Trips
Step 6: Identify Vehicles by Roadway Segment
Step 7: Calculate Clearance Times

Clearance time is the time between when the first person leaves their home until the last person reaches their destination. It includes mobilization time, travel time and queuing time delay. Evacuations must be

Basic Features of the Delmarva ATM

UNIT OBJECTIVES

Understand the structure and content of the ATM

- Microsoft Excel-based
- Includes 22 separate worksheets
- Includes four additional worksheets that comprise the consequence management module

Open the ATM and navigate through the spreadsheet modules

Understand how to interpret the clearance times worksheet

- Identifying focal points clearance times by scenario
- How county clearance times are determined

ATM STRUCTURE

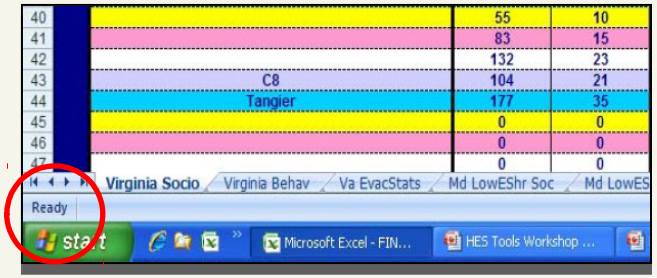
- Microsoft Excel-based
  - Accessible and easy to update
  - Provides reliable results
  - Allows testing of new scenarios “on the fly”
- Includes 22 separate but integrated worksheets
  - Three primary input modules (**socioeconomic data, behavioral data, out route assignment**)
  - One primary output module (**evacuation statistics**)
  - One module (**evacuating vehicles**) with inputs and outputs
- Four consequence management module locations
  - Virginia North (US 13 / US 113 at Pocomoke City, MD)

ATM CONTENT

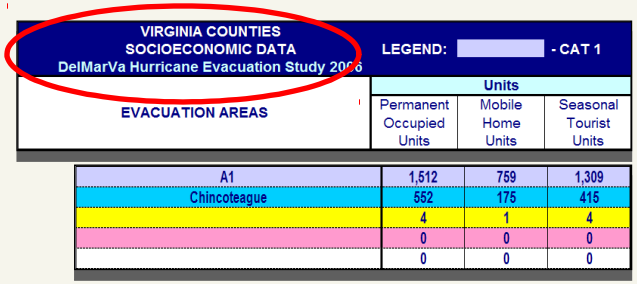
Open the ATM by double clicking on the Excel file icon

Immediately save a copy as “Delmarva ATM Navigation Test”

Use the arrows at the bottom of the screen to open the “Virginia Socio” worksheet



Navigate to the upper right hand corner of the worksheet



Raise hands to ask questions during the navigation

The instructor-guided navigation will

CLEARANCE TIMES WORKSHEET

Using the worksheet tabs, navigate to the Clearance Times worksheet which is labeled, “Clearance Tms”

ALL COUNTIES
CLEARANCE TIMES BY FOCAL POINT / CRITICAL ROADWAY SEGMENT
DelMarVa Hurricane Evacuation Study 2006

LEGEND: - CAT 1 - CAT 2 - CAT 3 - CAT 4

Regional Focal Points	Focal Point Location / Critical Roadway Segment	Clearance Times							
		Cat 1 Evac Veh Low Occ	Cat 1 Evac Veh High Occ	Cat 2 Evac Veh Low Occ	Cat 2 Evac Veh High Occ	Cat 3 Evac Veh Low Occ	Cat 3 Evac Veh High Occ	Cat 4 Evac Veh Low Occ	Cat 4 Evac Veh High Occ
Virginia	(No Regional Focal Points)								
Maryland	**US 13/US113 int at Pocomoke City**	3.9	4.8	4.4	5.4	5.1	6.2	5.7	6.8
	Rt 90/US 50 int w of Ocean City	8.4	20.4	11.2	25.2	12.5	28.3	12.7	28.5
	Rt 90/US113 interchange w of O City	5.3	10.7	6.9	13.3	7.4	14.7	7.4	14.7
	US 50/US113 interchange w of O City	5.6	9.8	6.2	10.9	6.3	11.5	6.2	11.4
	US 50/US13 Bypass int e of Salisbury	11.4	24.1	14.9	29.7	17.1	33.8	18.1	34.9
	Salisbury Bypass/US 50 int nw of Salisbury	6.6	19.5	9.0	24.0	11.9	29.2	14.4	31.6
	Rt 404/US 50 intersection near Wye Mills	7.6	19.5	13.0	32.5	19.0	41.6	24.2	46.8
	US 50/US 301 int near Queenstown	7.6	19.5	10.1	26.0	16.1	39.0	24.4	51.1	32.2	58.9
	Wm Lane Mem Bay Bridge	7.6	19.5	13.0	32.5	17.2	42.2	26.4	55.5	34.9	64.0
Delaware									
						6.4	19.4	7.9	22.7	8.9	23.7
						14.8	29.0	22.0	38.7	28.4	45.1
						16.6	38.2	24.5	50.7	33.4	59.6
						15.9	36.0	23.0	45.1	28.3	50.4

Focal Point Location / Critical Roadway Segment	Evac Serv Vol 1st Quarter of Evacuation	Evac Serv Vol 2nd Quarter of Evacuation	Evac Serv Vol 3rd Quarter of Evacuation	Evac Serv Vol 4th Quarter of Evacuation	Background Traffic Response Time Factor
(No Regional Focal Points)					
US 13/US113 int at Pocomoke City	**1,800**	**1656**	**1530**	**1800**	3
Rt 90/US 50 int w of Ocean City	1,520	1398.4	1292	1520	3
Rt 90/US113 interchange w of O City	2,000	1840	1700	2000	3
US 50/US113 interchange w of O City	1,520	1398.4	1292	1520	3
US 50/US13 Bypass int e of Salisbury	**1,520**	**1398.4**	**1292**	**1520**	3
Salisbury Bypass/US 50 int nw of Salisbury	1,520	1398.4	1292	1520	3
Rt 404/US 50 intersection near Wye Mills	**1,800**	**1656**	**1530**	**1800**	3
US 50/US 301 int near Queenstown	1,800	1656	1530	1800	3
Wm Lane Mem Bay Bridge	1,650	1518	1402.5	1650	3
Rt 404/US113 int near Georgetown	880	809.6	748	880	3
Rt 404/US13 int at Bridgeville	880	809.6	748	880	3
Rt 1/US113 interchange n of Milford	**1,800**	**1656**	**1530**	**1800**	3
Rt 10/Rt1/US13 int near Dover	2,100	1932	1785	2100	7

Background Traffic adjustment table inset for illustration purposes

CLEARANCE TIMES WORKSHEET

The Clearance Times Table

ALL COUNTIES CLEARANCE TIMES
[OUT OF REGION]
Delmarva Hurricane Evacuation Study - February 2007

Evacuation Parameters		County Clearance Times (in hours) [1]													
Evacuation	Rapidity of Response [2] /	*Delaware*			*Maryland*									*Virginia*	
Scenario	Tourist Occupancy	New Castle	Kent	Sussex	Cecil	Kent	Queen Anne's	Caroline	Talbot	Dorchester	Wicomico	Worcester	Somerset	Accomack	Northampton
Risk Based Roadway Network Loading															
CATEGORY 1															
	Low Tourist Occupancy														
	rapid response	3.5	10.5	10.5	4.1	4.1	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7
	medium response	5.0	12.0	12.0	5.6	5.6	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
	long response	7.0	14.0	14.0	7.6	7.6	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2
	High Tourist Occupancy														
	rapid response	3.5	23.3	23.3	4.4	4.4	**25.7**	**25.7**	**25.7**	**25.7**	**25.7**	**25.7**	**25.7**	**25.7**	**25.7**
	medium response	5.0	**24.8**	**24.8**	5.9	5.9	**27.2**	**27.2**	**27.2**	**27.2**	**27.2**	**27.2**	**27.2**	**27.2**	**27.2**
	long response	7.0	**26.8**	**26.8**	7.9	7.9	**29.2**	**29.2**	**29.2**	**29.2**	**29.2**	**29.2**	**29.2**	**29.2**	**29.2**
CATEGORY 2															
	Low Tourist Occupancy														
	rapid response	3.5	14.9	14.9	4.6	4.6	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1
	medium response	5.0	16.4	16.4	6.1	6.1	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6
	long response	7.0	18.4	18.4	8.1	8.1	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6
	High Tourist Occupancy														
	rapid response	3.5	**29.9**	**29.9**	5.0	5.0	**35.2**	**35.2**	**35.2**	**35.2**	**35.2**	**35.2**	**35.2**	**35.2**	**35.2**
	medium response	5.0	**31.4**	**31.4**	6.5	6.5	36.7	36.7	36.7	36.7	36.7	36.7	36.7	36.7	36.7
	long response	7.0	**33.4**	**33.4**	8.5	8.5	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7	38.7
CATEGORY 3															
	Low Tourist Occupancy														
	rapid response	3.5	20.9	20.9	5.1	5.1	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2
	medium response	5.0	22.4	22.4	6.6	6.6	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7
	long response	7.0	**24.4**	**24.4**	8.6	8.6	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7	27.7
	High Tourist Occupancy														
	rapid response	3.5	38.4	38.4	5.7	5.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7	47.7
	medium response	5.0	39.9	39.9	7.2	7.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2	49.2
	long response	7.0	41.9	41.9	9.2	9.2	51.2	51.2	51.2	51.2	51.2	51.2	51.2	51.2	51.2
CATEGORY 4															
	Low Tourist Occupancy														
	rapid response	3.5	**26.3**	**26.3**	5.6	5.6	32.7	32.7	32.7	32.7	32.7	32.7	32.7	32.7	32.7
	medium response	5.0	**27.8**	**27.8**	7.1	7.1	34.2	34.2	34.2	34.2	34.2	34.2	34.2	34.2	34.2
	long response	7.0	**29.8**	**29.8**	9.1	9.1	36.2	36.2	36.2	36.2	36.2	36.2	36.2	36.2	36.2
	High Tourist Occupancy														
	rapid response	3.5	43.8	43.8	6.2	6.2	56.2	56.2	56.2	56.2	56.2	56.2	56.2	56.2	56.2
	medium response	5.0	45.3	45.3	7.7	7.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7
	long response	7.0	47.3	47.3	9.7	9.7	59.7	59.7	59.7	59.7	59.7	59.7	59.7	59.7	59.7

CLEARANCE TIMES WORKSHEET

The Clearance Times Table Notes

Notes:	[1] A clearance time for a county is the time from the first evacuation movement until the last vehicle from the county reaches its final destination									
	[2] Rapidity of response will affect clearance times based on the following standard adjustments:									
	Long response =	2.0	hours							
	Rapid response =	-1.5	hours							
	Minimum medium response times for planning purposes is based on the response curve and equals 5 hours									
	[3] Clearance times from 24 to 36 hours in **BOLD**, clearance times greater than 36 hours in RED.									
	[4] CRITICAL SEGMENT DETERMINANTS									
	Newcastle County DE critical segment: Route 72 and US 13 intersection (determined by local focal point)									
	Sussex County DE and Kent County DE critical segment: Route 10 / Route 1 / US 13 interchange near Dover									
	Cecil County MD and Kent County MD critical segment: Route 272 and US 40 intersection (determined by local focal point)									
	Queen Anne's, Caroline, Talbot, Dorchester, Wicomico, Worcester and Somerset County MD and Accomack and Northampton County VA critical segment: William Preston Lane Memorial Bridge									

UNIT 3 – CAPSTONE QUIZ

Lists four benefits of the Microsoft Excel platform

Identify the six functional modules or groupings of worksheets included in the Delmarva ATM

Explain how the clearance times generated for each bottleneck or critical roadway segment are used to establish county clearance time estimates

UNIT 3 – SUMMARY

The Excel-based platform is assessable and easy to use. The model provides reliable results and allows users to test different scenarios.

The six functional groupings of worksheets or modules that include;

Demographic Data Module (5 regional worksheets)
Behavioral Data Module (5 regional worksheets)
Out Route Assignment Module
Evacuation Statistics Module (5 regional worksheets)
Evacuating Vehicles Module (Vehicles by Roadway, Clearance Times)
Consequence Management Module

The clearance time table is consulted to identify the regional bottlenecks with the worst clearance times. If a significant portion of a County's evacuating traffic passes through this bottleneck based on the data in the

Data Entry Modules

DEMONSTRATION I

UNIT OBJECTIVES

Understand the structure of the three primary data entry modules

- Socioeconomic data module
- Behavioral data module
- Out route assignment module

Identify the data entry features on the Evacuating Vehicles Module and Clearance Times worksheet

- Directional service volume multiplier
- Background traffic response time factor

Demonstrate proficiency in adding data to various worksheets

SOCIOECONOMIC DATA MODULE

Save a copy of the ATM as "**Delmarva ATM Demonstration I**"

Navigate to "**MDLowEShr Soc**" worksheet

LOWER MARYLAND COUNTIES SOCIOECONOMIC DATA
DelMarVa Hurricane Evacuation Study 2006

LEGEND: - CAT 1 - CAT 2 - CAT 3 - CAT 4 - INLAND

EVACUATION AREAS	Units			People			Vehicles			Tourists	
	Permanent Occupied Units	Mobile Home Units	Seasonal Tourist Units	People Per Permanent Unit	People Per Mobile Home Unit	People Per Tourist Unit	Vehicles Per Permanent Unit	Vehicles Per Mobile Home Unit	Vehicles Per Tourist Unit	Low Occupancy Tourist	High Occupancy Tourist
1	180	70	802	1.93	1.93	3.00	1.50	1.50	1.50	10%	90%
Ocean City North of Rt 90	1,863	946	7,986	1.93	1.93	3.00	1.50	1.50	1.50	10%	90%
	299	403	5,148	1.93	1.93	3.00	1.50	1.50	1.50	10%	90%
	68	113	1,034	1.93	1.93	3.00	1.50	1.50	1.50	10%	90%
	0	0	59	1.93	1.93	3.00	1.50	1.50	1.50	10%	90%

EVACUATION AREAS	Units						People					
	Permanent Occupied Units	Additional Permanent Occupied Units	Mobile Home Units	Additional Mobile Home Units	Seasonal Tourist Units	Additional Seasonal Tourist Units	People Per Permanent Unit	Additional People Per Permanent Unit	People Per Mobile Home Unit	Additional People Per Mobile Home Unit	People Per Tourist Unit	Additional People Per Tourist Unit
1	180		70		602		1.93		1.93		1.93	
Ocean City North of Rt 90	1,863		946		6,087		1.93		1.93		1.93	
	299		403		4,110		1.93		1.93		1.93	
	68		113		1,034		1.93		1.93		1.93	
	0		0		0		1.93		1.93		1.93	

The User Inputs table continues to the right within the worksheet

BEHAVIORAL DATA MODULE

LOWER MARYLAND COUNTIES
BEHAVIORAL DATA
DelMarva Hurricane Evacuation Study 2006

LEGEND: - CAT 1 - CAT 2 - CAT 3 - CAT 4 - INLAND

EVACUATION AREAS	Participation Rates											
	Cat 1 Part. Rate Perm. Units	Cat 1 Part. Rate MH Units	Cat 1 Part. Rate Tour. Units	Cat 2 Part. Rate Perm. Units	Cat 2 Part. Rate MH Units	Cat 2 Part. Rate Tour. Units	Cat 3 Part. Rate Perm. Units	Cat 3 Part. Rate MH Units	Cat 3 Part. Rate Tour. Units	Cat 4 Part. Rate Perm. Units	Cat 4 Part. Rate MH Units	Cat 4 Part. Rate Tour. Units
1	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Ocean City North of Rt 90	2%	70%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	1%	50%	50%	5%	70%	70%	100%	100%	100%	100%	100%	100%
	1%	50%	50%	1%	70%	70%	2%	100%	100%	100%	100%	100%
	1%	50%	50%	1%	70%	70%	2%	100%	100%	5%	100%	100%

Permanent Resident Destination Percentages								Vehicle Usage	
Cat 1 Percent to Local Dest	Cat 2 Percent to Local Dest	Cat 3 Percent to Local Dest	Cat 4 Percent to Local Dest	Cat 1 Percent Out of County	Cat 2 Percent Out of County	Cat 3 Percent Out of County	Cat 4 Percent Out of County	Vehicle Usage % Perm. & MH	Vehicle Usage % Tourist
70%	60%	50%	40%	30%	40%	50%	60%	80%	100%
75%	65%	55%	45%	25%	35%	45%	55%	70%	100%
75%	65%	55%	45%	25%	35%	45%	55%	70%	100%
80%	70%	60%	50%	20%	30%	40%	50%	70%	100%
85%	80%	70%	60%	15%	20%	30%	40%	70%	100%

Tourist Destination Percentages							
Cat 1 Percent to Local Dest	Cat 2 Percent to Local Dest	Cat 3 Percent to Local Dest	Cat 4 Percent to Local Dest	Cat 1 Percent Out of County	Cat 2 Percent Out of County	Cat 3 Percent Out of County	Cat 4 Percent Out of County
1%	1%	0%	0%	99%	99%	100%	100%
1%	1%	0%	0%	99%	99%	100%	100%
1%	1%	0%	0%	99%	99%	100%	100%
1%	1%	0%	0%	99%	99%	100%	100%
1%	1%	0%	0%	99%	99%	100%	100%

These table segments represent the complete column fields of the worksheet

OUT ROUTE ASSIGNMENT MODULE

Top Half

ALL COUNTIES
OUT ROUTE DATA
DelMarVa Hurricane Evacuation Study 2006

LEGEND: - CAT 1 - CAT 2 - CAT 3 - CAT 4

Percent of Out of County Vehicles Exiting State/Region/County by Specific Route

		Virginia		Maryland						Delaware						
		Other Local Evac Routes	US 13 NB	US 113 NB	US 13 NB	JS 50 / Bay B WB	US 301 NB	I-95 NB	I-95 SB	Rt 24 WB	Rt20 WB	Rt 404 WB	Rt 14 WB	Rt 1 NB	Rt 9 NB	Totals
Virginia	Northampton	50%	50%	0%	24%	24%	0%	0%	0%	0%	0%	0%	0%	21%	0%	100%
	Accomack	25%	75%	0%	36%	36%	0%	0%	0%	0%	0%	0%	0%	32%	0%	100%
Maryland	Worcester	0%	0%	35%	0%	65%	0%	0%	0%	0%	0%	0%	0%	33%	0%	100%
	Wicomico	0%	0%	0%	35%	65%	0%	0%	0%	0%	0%	0%	0%	33%	0%	100%
	Somerset	0%	0%	0%	35%	65%	0%	0%	0%	0%	0%	0%	0%	33%	0%	100%
	Dorchester	0%	0%	0%	25%	70%	5%	0%	0%	0%	0%	0%	0%	24%	0%	100%
	Talbot	0%	0%	0%	0%	75%	25%	0%	0%	0%	0%	0%	0%	8%	0%	100%
	Caroline	0%	0%	0%	15%	75%	10%	0%	0%	0%	0%	0%	0%	3%	0%	100%
	Queen Anne's	0%	0%	0%	0%	65%	35%	0%	0%	0%	0%	0%	0%	11%	0%	100%
	Kent	0%	0%	0%	0%	40%	40%	20%	0%	0%	0%	0%	0%	12%	0%	100%
	Cecil	0%	0%	0%	0%	0%	0%	35%	65%	0%	0%	0%	0%	0%	0%	100%
Delaware	Sussex	0%	0%	0%	0%	48%	0%	0%	0%	7%	8%	35%	0%	50%	0%	100%
	Kent	0%	0%	0%	0%	19%	0%	0%	0%	0%	0%	0%	20%	60%	20%	100%
	New Castle	0%	0%	0%	0%	0%	0%	0%	36%	0%	0%	0%	0%	80%	20%	100%

Data entry fields are on the top half of the worksheet, results are on the bottom

Bottom Half

		US 50 / Bay Bridge							
		Veh Cat 1 Low Occ	Veh Cat 1 High Occ	Veh Cat 2 Low Occ	Veh Cat 2 High Occ	Veh Cat 3 Low Occ	Veh Cat 3 High Occ	Veh Cat 4 Low Occ	Veh Cat 4 High Occ
Virginia	Northampton	59	98	105	158	192	264	261	332
	Accomack	664	1,314	1,056	1,763	1,486	2,260	1,923	2,699
Maryland	Worcester	2,992	19,847	5,093	24,796	7,354	29,853	8,890	31,385
	Wicomico	301	448	586	784	1,223	1,496	2,017	2,289
	Somerset	986	1,522	1,570	2,154	2,335	2,990	2,923	3,583
	Dorchester	699	1,277	1,236	1,854	1,915	2,587	2,841	3,511
	Talbot	386	1,344	1,076	2,237	2,127	3,542	3,100	4,517
	Caroline	134	236	275	418	600	799	965	1,164
	Queen Anne's	394	808	898	1,435	1,963	2,675	3,602	4,315
	Kent	81	401	149	585	400	1,016	641	1,253
	Cecil	0	0	0	0	0	0	0	0
Delaware	Sussex	4,817	16,767	9,282	23,307	15,203	31,690	20,085	36,575
	Kent	241	305	447	527	941	1,046	1,494	1,600
	New Castle	0	0	0	0	0	0	0	0
	Totals	**11,754**	**44,366**	**21,773**	**60,016**	**35,741**	**80,218**	**48,742**	**93,224**

The data entry fields on the top half of the worksheet list all modeled out routes

EVACUATING VEHICLES MODULE

ALL COUNTIES
EVACUATING VEHICLES BY FOCAL POINT / CRITICAL ROADWAY SEGMENT
DelMarVa Hurricane Evacuation Study 2006

LEGEND: - CAT 1 - CAT 2 - CAT 3 - CAT 4

user inputs directional service volume depending upon normal or reverse lane operation

Regional Focal Points	Focal Point Location / Critical Roadway Segment	Evacuation Directional Service	Cat 1 Evac Veh Low Occ	Cat 1 Evac Veh High Occ	Cat 2 Evac Veh Low Occ	Cat 2 Evac Veh High Occ	Cat 3 Evac Veh Low Occ	Cat 3 Evac Veh High Occ	Cat 4 Evac Veh Low Occ	Cat 4 Evac Veh High Occ
Virginia	(No Regional Focal Points)									
Maryland	**US 13/US113 int at Pocomoke City**	1,800	1,507	2,941	2,418	4,003	3,498	5,260	4,550	6,315
	Rt 90/US 50 int w of Ocean City	1,520	7,602	24,494	11,583	31,297	13,439	35,689	13,666	35,926
	Rt 90/US113 interchange w of O City	2,000	4,257	14,311	7,203	19,060	8,240	21,694	8,197	21,649
	US 50/US113 interchange w of O City	1,520	3,728	9,569	4,452	11,094	4,677	11,992	4,504	11,817
	US 50/Salisbury Bypass int e of Salisbury	1,520	9,018	26,966	13,905	34,800	17,035	40,629	18,509	42,119
	US 50/US13 through Salisbury	1,520	5,002	23,228	8,409	29,655	12,592	36,864	16,014	40,289
	Rt 404/US 50 intersection near Wye Mills	1,800	9,010	36,899	16,604	49,236	26,640	64,374	35,381	73,119
	US 50/US 301 int near Queenstown	1,800	11,754	44,366	21,773	60,016	35,741	80,218	48,742	93,224
	Wm Lane Mem Bay Bridge	1,650	11,754	44,366	21,773	60,016	35,741	80,218	48,742	93,224
Delaware	Rt 404/US113 int near Georgetown	880	1,611	10,687	2,742	13,361	3,960	16,075	4,787	16,900
	Rt 404/US13 int at Bridgeville	880	5,205	15,201	9,586	21,244	15,484	29,131	20,697	34,349
	Rt 1/US113 interchange n of Milford	1,800	11,508	43,612	21,000	58,654	35,823	79,566	50,746	94,493
	Rt 10/Rt1/US13 int near Dover	2,100	10,582	42,294	19,278	56,388	31,158	74,118	41,531	84,493

Service Volume adjustment column highlighted for illustration purposes

DEMONSTRATION I

This instructor-led demonstration should take 15 minutes to complete

Participants will build skills in entering data into the ATM and reading the results

Instructors will walk through the demonstration using the ATM to answer each question

Participants are encouraged to ask questions during the demonstration

Remember - Work from the copy of the ATM saved as "Delmarva ATM Demonstration I"

UNIT 4 – CAPSTONE QUIZ

Identify which of the three primary data entry modules is best suited for updating data and testing new scenarios

Identify what element can be adjusted on the Evacuating Vehicles by Focal Point/Critical Roadway Segment worksheet

Identify what element can be adjusted on the Clearance Time worksheet

UNIT 4 – SUMMARY

While the three primary data entry modules; Socioeconomic, Behavioral, and Out Route Assignment, can all be modified by users, the Socioeconomic Data module includes an easy to edit table to adjust for common changes such as population growth

The Evacuating Vehicles by Focal Point/Critical Roadway Segment worksheet includes a table that allows users to adjust the service volumes on local and regional critical roadway segments

The Clearance Time worksheet includes a column that can be adjusted to account for changes in anticipated background traffic

Data Results Modules

DEMONSTRATION II

UNIT OBJECTIVES

Understand the structure of the two primary data results modules

- Evacuation Statistics module
- Evacuating Vehicles module

Interpret the data results portion of the Out Route Assignments module

Understand the connection between the Clearance Times worksheet and the HES's Clearance Times table

Demonstrate proficiency in identifying and interpreting data from various worksheets

EVACUATION STATISTICS MODULE

Save a copy of the ATM as "**Delmarva ATM Demonstration II**"

Navigate to "**Delaware EvacSt**" worksheet

DELAWARE COUNTIES
EVACUATION STATISTICS DATA
DelMarVa Hurricane Evacuation Study 2006

LEGEND: - CAT 1 - CAT 2 - CAT 3 - CAT 4 - INLAND

EVACUATION AREAS	Evacuating People								Evacuating Vehicles							
	Cat 1 Evac Pop Low Occ	Cat 1 Evac Pop High Occ	Cat 2 Evac Pop Low Occ	Cat 2 Evac Pop High Occ	Cat 3 Evac Pop Low Occ	Cat 3 Evac Pop High Occ	Cat 4 Evac Pop Low Occ	Cat 4 Evac Pop High Occ	Cat 1 Evac Veh Low Occ	Cat 1 Evac Veh High Occ	Cat 2 Evac Veh Low Occ	Cat 2 Evac Veh High Occ	Cat 3 Evac Veh Low Occ	Cat 3 Evac Veh High Occ	Cat 4 Evac Veh Low Occ	Cat 4 Evac Veh High Occ
1	23	35	23	35	23	35	23	35	16	27	16	27	16	27	16	27
Fenwick Island State Park - Oceanside	93	463	738	1,149	738	1,149	738	1,149	69	394	466	827	466	827	466	827
	26	120	48	179	344	531	344	531	19	102	33	149	217	381	217	381
	3	15	4	20	6	29	57	81	2	12	3	17	4	25	36	56
	3	15	4	20	6	29	7	30	2	12	3	17	4	25	5	26

Evac Vehicles to Local Destinations								Evac Vehicles to Out of County							
Local Dest Veh Cat 1 Low Occ	Local Dest Veh Cat 1 High Occ	Local Dest Veh Cat 2 Low Occ	Local Dest Veh Cat 2 High Occ	Local Dest Veh Cat 3 Low Occ	Local Dest Veh Cat 3 High Occ	Local Dest Veh Cat 4 Low Occ	Local Dest Veh Cat 4 High Occ	OutofCounty Veh Cat 1 Low Occ	OutofCounty Veh Cat 1 High Occ	OutofCounty Veh Cat 2 Low Occ	OutofCounty Veh Cat 2 High Occ	OutofCounty Veh Cat 3 Low Occ	OutofCounty Veh Cat 3 High Occ	OutofCounty Veh Cat 4 Low Occ	OutofCounty Veh Cat 4 High Occ
10	10	9	9	7	7	6	6	6	17	7	18	9	20	10	21
22	26	274	278	231	232	189	190	47	368	192	549	235	595	277	637
7	8	12	14	108	108	88	88	12	94	21	135	109	273	129	293
1	0	1	1	1	1	17	16	1	12	2	16	3	24	19	40
1	1	1	1	1	2	1	2	1	11	2	16	3	23	4	24

These table segments represent the complete column fields of the worksheet

EVACUATING VEHICLES MODULE

ALL COUNTIES
EVACUATING VEHICLES BY FOCAL POINT / CRITICAL ROADWAY SEGMENT
DelMarVa Hurricane Evacuation Study 2006

LEGEND: - CAT 1 - CAT 2 - CAT 3 - CAT 4

user inputs directional service volume depending upon normal or reverse lane operation

Regional Focal Points	Focal Point Location / Critical Roadway Segment	Evacuation Directional Service	Cat 1 Evac Veh Low Occ	Cat 1 Evac Veh High Occ	Cat 2 Evac Veh Low Occ	Cat 2 Evac Veh High Occ	Cat 3 Evac Veh Low Occ	Cat 3 Evac Veh High Occ	Cat 4 Evac Veh Low Occ	Cat 4 Evac Veh High Occ
Virginia	(No Regional Focal Points)									
Maryland	**US 13/US113 int at Pocomoke City**	1,800	1,507	2,941	2,418	4,003	3,498	5,260	4,550	6,315
	Rt 90/US 50 int w of Ocean City	1,520	7,602	24,494	11,583	31,297	13,439	35,689	13,666	35,926
	Rt 90/US113 interchange w of O City	2,000	4,257	14,311	7,203	19,060	8,240	21,694	8,197	21,649
	US 50/US113 interchange w of O City	1,520	3,728	9,569	4,452	11,094	4,677	11,992	4,504	11,817
	US 50/Salisbury Bypass int e of Salisbury	1,520	9,018	26,966	13,905	34,800	17,035	40,629	18,509	42,119
	US 50/US13 through Salisbury	1,520	5,002	23,228	8,409	29,655	12,592	36,864	16,014	40,289
	Rt 404/US 50 intersection near Wye Mills	1,800	9,010	36,899	16,604	49,236	26,640	64,374	35,381	73,119
	US 50/US 301 int near Queenstown	1,800	11,754	44,366	21,773	60,016	35,741	80,218	48,742	93,224
	Wm Lane Mem Bay Bridge	1,650	11,754	44,366	21,773	60,016	35,741	80,218	48,742	93,224
Delaware	Rt 404/US113 int near Georgetown	880	1,611	10,687	2,742	13,361	3,960	16,075	4,787	16,900
	Rt 404/US13 int at Bridgeville	880	5,205	15,201	9,586	21,244	15,484	29,131	20,697	34,349
	Rt 1/US113 interchange n of Milford	1,800	11,508	43,612	21,000	68,654	35,823	79,566	50,746	94,493
	Rt 10/Rt1/US13 int near Dover	2,100	10,582	42,294	19,278	56,388	31,158	74,118	41,531	84,493

Service Volume adjustment column highlighted for illustration purposes

OUT ROUTE ASSIGNMENT MODULE

Top Half

ALL COUNTIES
OUT ROUTE DATA
DelMarVa Hurricane Evacuation Study 2006

LEGEND: - CAT 1 - CAT 2 - CAT 3 - CAT 4

Percent of Out of County Vehicles Exiting State/Region/County by Specific Route

		Virginia		Maryland						Delaware						
		Other Local Evac Routes	US 13 NB	US 113 NB	US 13 NB	JS 50 / Bay B WB	US 301 NB	I-95 NB	I-95 SB	Rt 24 WB	Rt20 WB	Rt 404 WB	Rt 14 WB	Rt 1 NB	Rt 9 NB	Totals
Virginia	Northampton	50%	50%	0%	24%	24%	0%	0%	0%	0%	0%	0%	0%	21%	0%	100%
	Accomack	25%	75%	0%	36%	36%	0%	0%	0%	0%	0%	0%	0%	32%	0%	100%
Maryland	Worcester	0%	0%	35%	0%	65%	0%	0%	0%	0%	0%	0%	0%	33%	0%	100%
	Wicomico	0%	0%	0%	35%	65%	0%	0%	0%	0%	0%	0%	0%	33%	0%	100%
	Somerset	0%	0%	0%	35%	65%	0%	0%	0%	0%	0%	0%	0%	33%	0%	100%
	Dorchester	0%	0%	0%	25%	70%	5%	0%	0%	0%	0%	0%	0%	24%	0%	100%
	Talbot	0%	0%	0%	0%	75%	25%	0%	0%	0%	0%	0%	0%	8%	0%	100%
	Caroline	0%	0%	0%	15%	75%	10%	0%	0%	0%	0%	0%	0%	3%	0%	100%
	Queen Anne's	0%	0%	0%	0%	65%	35%	0%	0%	0%	0%	0%	0%	11%	0%	100%
	Kent	0%	0%	0%	0%	40%	40%	20%	0%	0%	0%	0%	0%	12%	0%	100%
	Cecil	0%	0%	0%	0%	0%	0%	35%	65%	0%	0%	0%	0%	0%	0%	100%
Delaware	Sussex	0%	0%	0%	0%	48%	0%	0%	0%	7%	8%	35%	0%	50%	0%	100%
	Kent	0%	0%	0%	0%	19%	0%	0%	0%	0%	0%	0%	20%	60%	20%	100%
	New Castle	0%	0%	0%	0%	0%	0%	0%	36%	0%	0%	0%	0%	80%	20%	100%

Data entry fields are on the top half of the worksheet, results are on the bottom

Bottom Half

		US 50 / Bay Bridge							
		Veh Cat 1 Low Occ	Veh Cat 1 High Occ	Veh Cat 2 Low Occ	Veh Cat 2 High Occ	Veh Cat 3 Low Occ	Veh Cat 3 High Occ	Veh Cat 4 Low Occ	Veh Cat 4 High Occ
Virginia	Northampton	59	98	105	158	192	264	261	332
	Accomack	664	1,314	1,056	1,763	1,486	2,260	1,923	2,699
Maryland	Worcester	2,992	19,847	5,093	24,796	7,354	29,853	8,890	31,385
	Wicomico	301	448	586	784	1,223	1,496	2,017	2,289
	Somerset	986	1,522	1,570	2,154	2,335	2,990	2,923	3,583
	Dorchester	699	1,277	1,236	1,854	1,915	2,587	2,841	3,511
	Talbot	386	1,344	1,076	2,237	2,127	3,542	3,100	4,517
	Caroline	134	236	275	418	600	799	965	1,164
	Queen Anne's	394	808	898	1,435	1,963	2,675	3,602	4,315
	Kent	81	401	149	585	400	1,016	641	1,253
	Cecil	0	0	0	0	0	0	0	0
Delaware	Sussex	4,817	16,767	9,282	23,307	15,203	31,690	20,085	36,575
	Kent	241	305	447	527	941	1,046	1,494	1,600
	New Castle	0	0	0	0	0	0	0	0
	Totals	**11,754**	**44,366**	**21,773**	**60,016**	**35,741**	**80,218**	**48,742**	**93,224**

The data entry fields on the top half of the worksheet list all modeled out routes

CLEARANCE TIMES WORKSHEET

Regional Focal Points	Focal Point Location / Critical Roadway Segment	Clearance Times							
		Cat 1 Evac Veh Low Occ	Cat 1 Evac Veh High Occ	Cat 2 Evac Veh Low Occ	Cat 2 Evac Veh High Occ	Cat 3 Evac Veh Low Occ	Cat 3 Evac Veh High Occ	Cat 4 Evac Veh Low Occ	Cat 4 Evac Veh High Occ
Virginia	(No Regional Focal Points)								
Maryland	**US 13/US113 int at Pocomoke City**	**3.9**	**4.8**	**4.4**	**5.4**	**5.1**	**6.2**	**5.7**	**6.8**
	Rt 90/US 50 int w of Ocean City	8.4	20.4	11.2	25.2	12.5	28.3	12.7	28.5
	Rt 90/US113 interchange w of O City	5.3	10.7	6.9	13.3	7.4	14.7	7.4	14.7
	US 50/US113 interchange w of O City	5.6	9.8	6.2	10.9	6.3	11.5	6.2	11.4
	US 50/US13 Bypass int e of Salisbury	**11.4**	**24.1**	**14.9**	**29.7**	**17.1**	**33.8**	**18.1**	**34.9**
	Salisbury Bypass/US 50 int nw of Salisbury	6.6	19.5	9.0	24.0	11.9	29.2	14.4	31.6
	Rt 404/US 50 intersection near Wye Mills	**8.4**	**25.1**	**13.0**	**32.5**	**19.0**	**[illegible]**	**24.2**	**46.8**
	US 50/US 301 int near Queenstown	10.0	29.6	16.1	39.0	24.4	51.1	32.2	58.9
	Wm Lane Mem Bay Bridge	10.7	32.0	17.2	42.2	26.4	55.5	34.9	64.0
Delaware	Rt 404/US113 int near Georgetown	5.0	16.1	6.4	19.4	7.9	22.7	8.9	23.7
	Rt 404/US13 int at Bridgeville	9.4	21.6	14.8	29.0	22.0	[illegible]	28.4	45.1
	Rt 1/US113 interchange n of Milford	**9.9**	**29.1**	**15.6**	**38.2**	**24.5**	**50.[illegible]**	**33.4**	**59.6**
	Rt 10/Rt1/US13 int near Dover	12.4	28.7	16.9	36.0	23.0	45.[illegible]	28.3	50.4

Local Focal Points	Focal Point Location / Critical Roadway Segment	Clearance Times							
		Cat 1 Evac Veh Low Occ	Cat 1 Evac Veh High Occ	Cat 2 Evac Veh Low Occ	Cat 2 Evac Veh High Occ	Cat 3 Evac Veh Low Occ	Cat 3 Evac Veh High Occ	Cat 4 Evac Veh Low Occ	Cat 4 Evac Veh High Occ
Virginia Northampton	Rt 184 and US13 int near Cape Charles	0.2	0.2	0.3	0.4	0.5	0.6	0.5	0.6
	Rt 183 and US13 int near Exmore	0.1	0.2	0.1	0.2	0.2	0.3	0.2	0.3
Virginia Accomack	Rt 175/Chincoteague Rd and US13 int	3.0	4.9	3.6	5.6	3.9	5.9	4.4	6.4
	Market St/US 13 int at Onley e of Onancock	0.3	0.5	0.8	0.9	1.0	1.2	1.2	1.3
Maryland Worcester	Philadelphia Ave/US 50 int in O City	1.4	8.0	1.9	9.5	2.1	10.5	2.1	10.5
	Coastal Hwy/Rt 90 int in Ocean City	2.1	11.9	3.3	15.0	3.6	16.9	3.5	16.8
	Rt 12 and US113 int at Snow Hill	0.1	0.1	0.1	0.2	0.3	0.3	0.4	0.5
Maryland Wicomico	Rt 349 and US 13 intersection	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9
	Rt 347 and US 50 intersection	3.4	3.5	3.7	3.8	4.1	4.2	4.4	4.5
Maryland Somerset	Rt 413 and US 13 intersection	10.0	10.7	11.0	11.7	11.9	12.7	11.9	12.7
	Rt 363 and US 13 intersection	7.9	8.2	8.1	8.4	8.3	8.6	8.3	8.6
Maryland Dorchester	Rt 16 and US 50 intersection at Cambridge	8.0	8.3	8.4	8.7	8.4	8.7	8.4	8.7
Maryland Talbot	Rt 33 and US 50 intersection at Easton	4.1	5.3	6.3	7.8	8.7	10.5	9.8	11.5
Maryland Caroline	Rt 16 and Rt404 intersection	11.8	23.9	16.3	30.5	22.3	38.9	27.2	43.8
Maryland Queen Anne's	Rt 405 and US301 intersection	3.0	3.1	3.1	3.2	3.2	3.3	3.3	3.4
Maryland Kent	Rt 291 and US 301 intersection	3.4	3.9	3.7	4.4	5.1	6.0	5.9	6.7
Maryland Cecil	Rt 272 and US 40 intersection	5.6	5.9	6.1	6.5	6.6	7.2	7.1	7.7
Delaware Sussex	Rt 54 through Bayville	6.2	8.2	7.7	9.9	8.0	10.3	8.0	10.3
	Rt 26 through Millville	11.1	23.1	21.1	34.6	25.2	39.6	25.8	40.2
	Rt 1 and US 9 int	0.8	1.6	1.3	2.3	2.1	3.4	2.6	3.8
Delaware Kent	Rt 8 and US13 intersection at Dover	0.3	0.4	0.4	0.5	0.5	0.7	0.6	0.7
Delaware New Castle	Rt 72 and US13 intersection	0.1	0.2	0.5	0.5	1.1	1.1	1.2	1.2

Identify the worst segment clearance time to help determine the County Clearance Time.

CLEARANCE TIME TABLE

ALL COUNTIES CLEARANCE TIMES
[OUT OF REGION]
Delmarva Hurricane Evacuation Study - February 2007

Evacuation Parameters		County Clearance Times (in hours) [1]													
		Delaware			*Maryland*									*Virginia*	
Evacuation Scenario	Rapidity of Response [2] / Tourist Occupancy	New Castle	Kent	Sussex	Cecil	Kent	Queen Anne's	Caroline	Talbot	Dorchester	Wicomico	Worcester	Somerset	Accomack	Northampton
Risk Based Roadway Network Loading															
CATEGORY 1															
	Low Tourist Occupancy														
	rapid response	3.5	10.5	10.5	4.1	4.1	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7	8.7
	medium response	5.0	12.0	12.0	5.6	5.6	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
	long response	7.0	14.0	14.0	7.6	7.6	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2
	High Tourist Occupancy														
	rapid response	3.5	23.3	23.3	4.4	4.4	**25.7**	**25.7**	**25.7**	**25.7**	**25.7**	**25.7**	**25.7**	**25.7**	**25.7**
	medium response	5.0	**24.8**	**24.8**	5.9	5.9	**27.2**	**27.2**	**27.2**	**27.2**	**27.2**	**27.2**	**27.2**	**27.2**	**27.2**
	long response	7.0	**26.8**	**26.8**	7.9	7.9	**29.2**	**29.2**	**29.2**	**29.2**	**29.2**	**29.2**	**29.2**	**29.2**	**29.2**
CATEGORY 2															
	Low Tourist Occupancy														
	rapid response	3.5	14.9	14.9	4.6	4.6	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1
	medium response	5.0	16.4	16.4	6.1	6.1	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6
	long response	7.0	18.4	18.4	8.1	8.1	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6	18.6
	High Tourist Occupancy														
	rapid response	3.5	**29.9**	**29.9**	5.0	5.0	**35.2**	**35.2**	**35.2**	**35.2**	**35.2**	**35.2**	**35.2**	**35.2**	**35.2**
	medium response	5.0	**31.4**	**31.4**	6.5	6.5	**36.7**	**36.7**	**36.7**	**36.7**	**36.7**	**36.7**	**36.7**	**36.7**	**36.7**
	long response	7.0	**33.4**	**33.4**	8.5	8.5	**38.7**	**38.7**	**38.7**	**38.7**	**38.7**	**38.7**	**38.7**	**38.7**	**38.7**
CATEGORY 3															
	Low Tourist Occupancy														
	rapid response	3.5	20.9	20.9	5.1	5.1	**24.2**	**24.2**	**24.2**	**24.2**	**24.2**	**24.2**	**24.2**	**24.2**	**24.2**
	medium response	5.0	22.4	22.4	6.6	6.6	**25.7**	**25.7**	**25.7**	**25.7**	**25.7**	**25.7**	**25.7**	**25.7**	**25.7**
	long response	7.0	**24.4**	**24.4**	8.6	8.6	**27.7**	**27.7**	**27.7**	**27.7**	**27.7**	**27.7**	**27.7**	**27.7**	**27.7**
	High Tourist Occupancy														
	rapid response	3.5	**38.4**	**38.4**	5.7	5.7	**47.7**	**47.7**	**47.7**	**47.7**	**47.7**	**47.7**	**47.7**	**47.7**	**47.7**
	medium response	5.0	**39.9**	**39.9**											
	long response	7.0	**41.9**	**41.9**											
CATEGORY 4															
	Low Tourist Occupancy														
	rapid response	3.5	**26.3**												
	medium response	5.0	**27.8**												
	long response	7.0	**29.8**												
	High Tourist Occupancy														
	rapid response	3.5	**43.8**												
	medium response	5.0	**45.3**												
	long response	7.0	**47.3**												

Notes: [1] A clearance time for a county is the time from the first evacuation movement until the last vehicle from the county reaches its final destination

[2] Rapidity of response will affect clearance times based on the following standard adjustments:

Long response = 2.0 hours

Rapid response = -1.5 hours

Minimum medium response times for planning purposes is based on the response curve and equals 5 hours

[3] Clearance times from 24 to 36 hours in **BOLD**, clearance times greater than 36 hours in RED.

[4] CRITICAL SEGMENT DETERMINANTS

Newcastle County DE critical segment: Route 72 and US 13 intersection (determined by local focal point)

Sussex County DE and Kent County DE critical segment: Route 10 / Route 1 / US 13 interchange near Dover

Cecil County MD and Kent County MD critical segment: Route 272 and US 40 intersection (determined by local focal point)

Queen Anne's, Caroline, Talbot, Dorchester, Wicomico, Worcester and Somerset County MD and Accomack and Northampton County VA critical segment: William Preston Lane Memorial Bridge

Clearance Time Table Notes inset provided for illustration purposes

DEMONSTRATION II

This instructor-led demonstration should take 15 minutes to complete

Participants will build skills navigating the ATM and locating and interpreting the results

Instructors will walk through the demonstration using the ATM to answer each question

Participants are encouraged to ask questions during the demonstration

Remember – Work from the copy of the ATM

UNIT 5 – CAPSTONE QUIZ

Identify which module includes information about the total number of evacuees or vehicles for a County

Identify which other worksheets are affected if changes are made in the Out Route Assignment Module

Explain how the clearance times at regional and local bottlenecks are used to determine a County clearance time

UNIT 5 – SUMMARY

The Evacuation Statistics module includes summary information on the total number of evacuating people and vehicles for a County

Changes made in the Out Route Assignment Module also reflected in the two worksheet that make up the Evacuating Vehicles Module; the Evacuating Vehicles by Bottleneck/Critical Roadway Segment worksheet and the Clearance Times worksheet.

The least efficient (worst) clearance time at regional or local bottlenecks along a county's primary evacuation routes determines its

Consequence Management Module

EXERCISE I

UNIT OBJECTIVES

Understand the purpose and use of the Consequence Management module

Identify the data entry features of the module

Understand the how the Consequence Management module provides a picture of traffic dynamics during an evacuation

Demonstrate proficiency in using the full ATM and the Consequence Management module in support of a facilitated table top

CONSEQUENCE MANAGEMENT

Virginia North - US 13 / US 113 Interchange at Pocomoke City, MD
CONSEQUENCE MANAGEMENT ASSESSMENT
Delmarva Hurricane Evacuation Study 2006

	Evacuating Vehicles at Link	Avg Pop per Vehicle	Evacuating Population	Background Total	Average Daily Trips
VA North	6,315	2.50	15,788	934	18,875

Longest Queue Length:	- Vehicles, or	0.0	Miles
12-Hour Queue Length:	- Vehicles, or	0.0	Miles
18-Hour Queue Length:	- Vehicles, or	0.0	Miles
24-Hour Queue Length:	- Vehicles, or	0.0	Miles
36-Hour Queue Length:	- Vehicles, or	0.0	Miles

Primary Input Lanes: 2

Hour into Evacuation	Evacuation Loading	Background Loading	LOS D Hourly Volume
1	2%	97%	1,800
2	5%	90%	
3	7%	80%	
4	10%	60%	
5	15%	35%	
6	22%	20%	
7	15%	10%	
8	10%	7%	
9	7%	4%	
10	5%	2%	
11	2%	0%	
12 and onward	0%	0%	

EVACUATING VEHICLES

Hour into Evacuation	Hourly Operational Svc Vol	Hourly Evacuation Demand	Hourly Evacuation Allocation	Hourly Evacuation Queue	Total Segment Queue	Total Evacuation Queue	Actual Evacuation Queue	Evacuation Vehicle Thru-put	Evacuation Vehicles Remaining	Total Vehicles Remaining
1	1,800	126	220	(94)	(767)	(94)	0	126	6,315	10,099
2	1,800	316	491	(176)	(643)	(130)	0	442	6,189	9,067
3	1,800	442	669	(227)	(610)	(160)	0	884	5,873	7,910
4	1,620	632	858	(227)	(428)	(142)	0	1,516	5,431	6,720
5	1,620	947	1,204	(257)	(346)	(146)	0	2,463	4,800	5,528
6	1,620	1,389	1,428	(39)	(44)	(23)	0	3,852	3,852	4,254
7	1,440	947	1,311	(363)	(399)	(226)	0	4,800	2,463	2,678
8	1,440	632	1,305	(673)	(743)	(441)	0	5,431	1,516	1,637
9	1,440	442	1,328	(886)	(961)	(585)	0	5,873	884	940
10	1,800	316	1,699	(1,384)	(1,466)	(909)	0	6,189	442	461
11	1,800	126	1,800	(1,674)	(1,674)	(1,047)	0	6,315	126	126
12	1,800	0	0	0	0	0	0	6,315	0	0
13	1,800	0	0	0	0	0	0	6,315	0	0

Shelter Capacity (10 Mile Radius)	Capacity	Availability	Density (s.f.)
	8,773	100%	40

Shelter Capacity (20 Mile Radius)	Capacity	Availability	Density (s.f.)
	12,843	100%	20

VA North Remaining Evacuating Population to Shelter Capacity (10 Mile Radius)	VA North Remaining Evacuating Population to Shelter Capacity (20 Mile Radius)	Hour into Evacuation
(16,475)	438	1
(13,894)	3,019	2
(11,002)	5,911	3
(8,028)	8,885	4
(5,048)	11,865	5
(1,862)	15,051	6
2,078	18,991	7
4,680	21,593	8
6,423	23,336	9
7,621	24,534	10
8,457	25,370	11
8,773	25,686	12
8,773	25,686	13
8,773	25,686	14
8,773	25,686	15
8,773	25,686	16
8,773	25,686	17
8,773	25,686	18
8,773	25,686	19
8,773	25,686	20
8,773	25,686	21

Four CM Modules cover:

- **Virginia North** (US 13 / US 113 at Pocomoke City, MD)
- **Maryland Shore West** (US 50 / US 13 Bypass near Salisbury, MD)
- **Maryland Tri-State West** (Route 404 / US 50 near Wyes Mills, MD)
- **Delaware North** (US 1 / US113 near Milford, DE)

Total vehicles remaining at the CM point provided on an hourly basis

EXERCISE I

This participant exercise should take 20 minutes to complete

Participants will be expected to navigate the full ATM and the Consequence Management module and to answer the exercise questions on their own

Instructors will monitor participant progress and provide assistance only as needed

Remember - Work from the copy of the ATM saved as "Delmarva ATM Exercise I"

UNIT 6 – CAPSTONE QUIZ

List the four critical bottlenecks that include consequence management worksheets

Identify two factors that make up the total number of vehicles that need to pass through a consequence management point

Identify the four primary user defined input features

UNIT 6 – SUMMARY

The Consequence Management module was developed to better understand evacuation dynamic during an evacuation

The ATM includes CM worksheets for four locations;

Virginia North (US 13 / US 113 at Pocomoke City, MD)

Maryland Shore West (US 50 / US 13 Bypass near Salisbury, MD)

Maryland Tri-State West (Route 404 / US 50 near Wyes Mills, MD)

Delaware North (US 1 / US113 near Milford, DE)

The CM module includes several user defined features, including people per vehicle, primary evacuating lanes, average daily trips, and LOS D hourly volume.

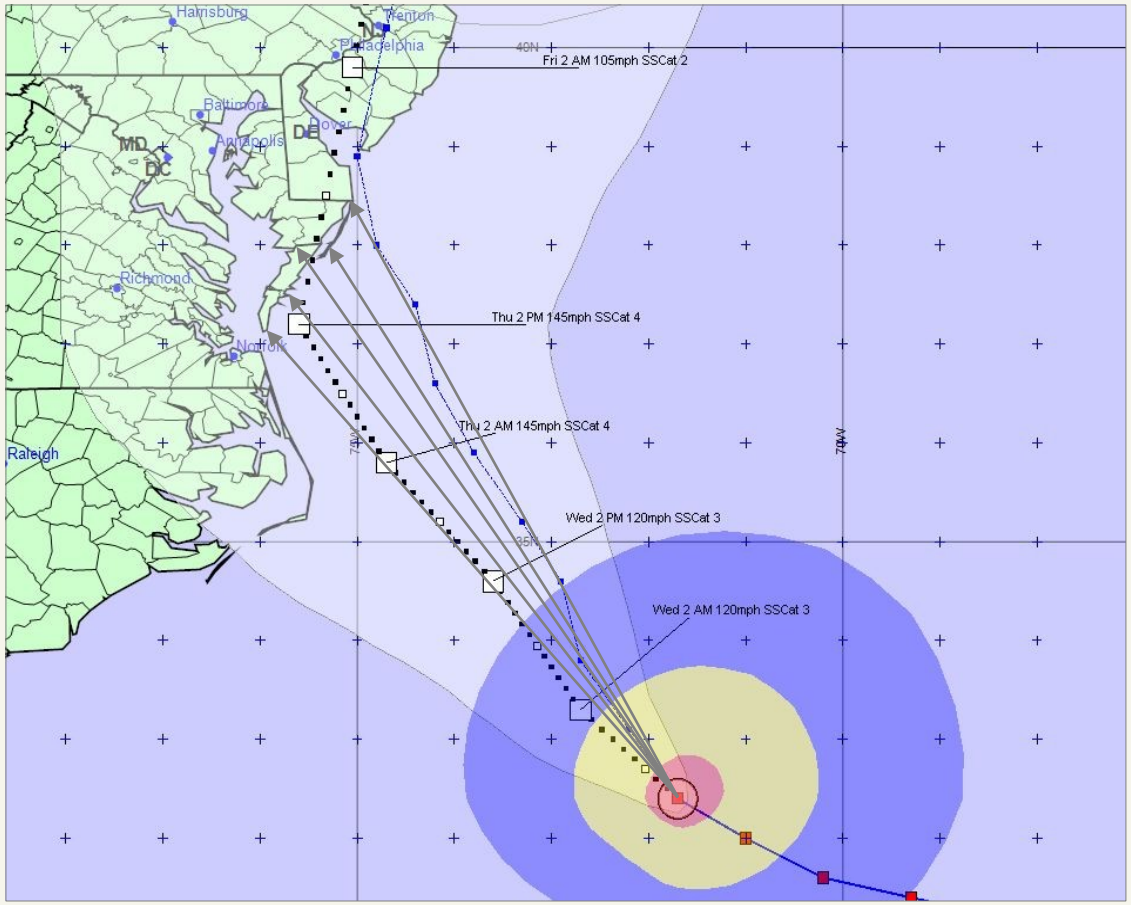
UNIT 7

Using ATM clearance time results in HURREVAC

EXERCISE II

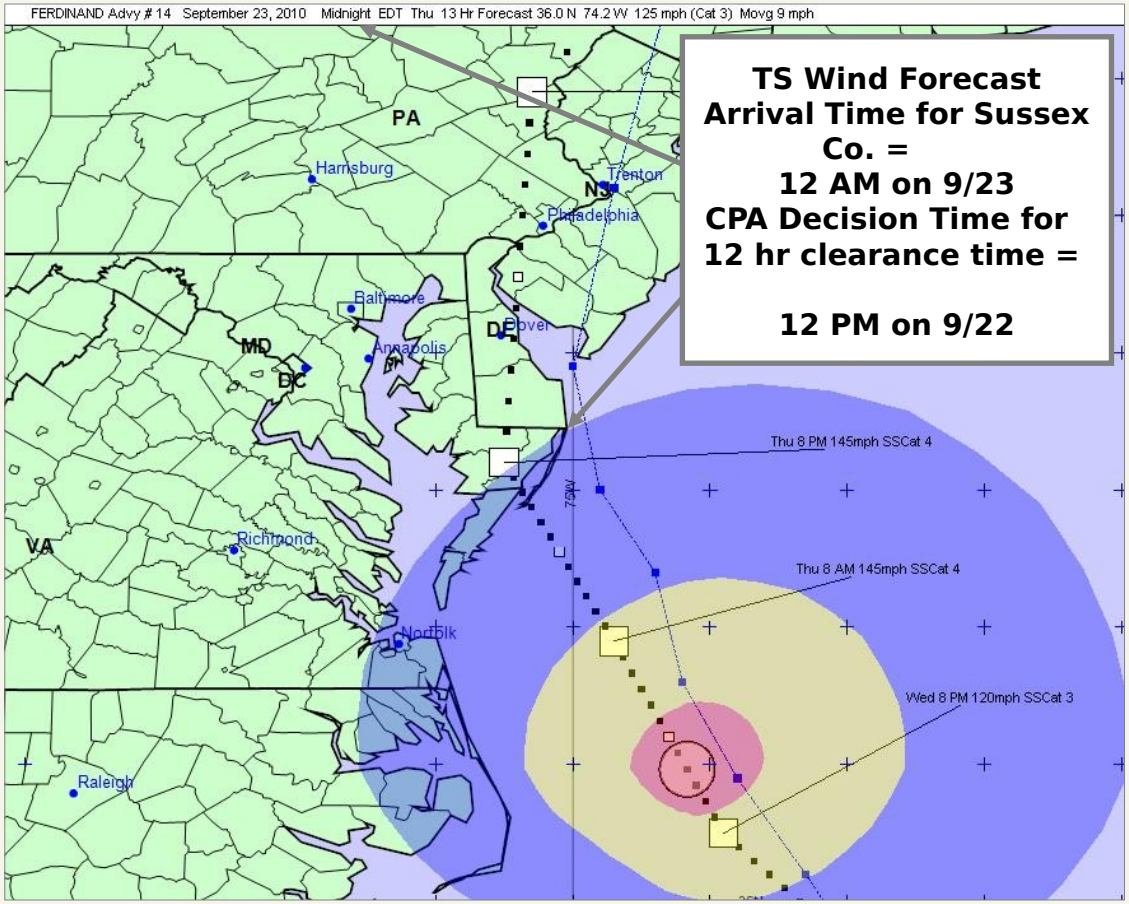
DIRECT TO POINT

Direct to Point (DTP)
Evacuation Timing Assumptions



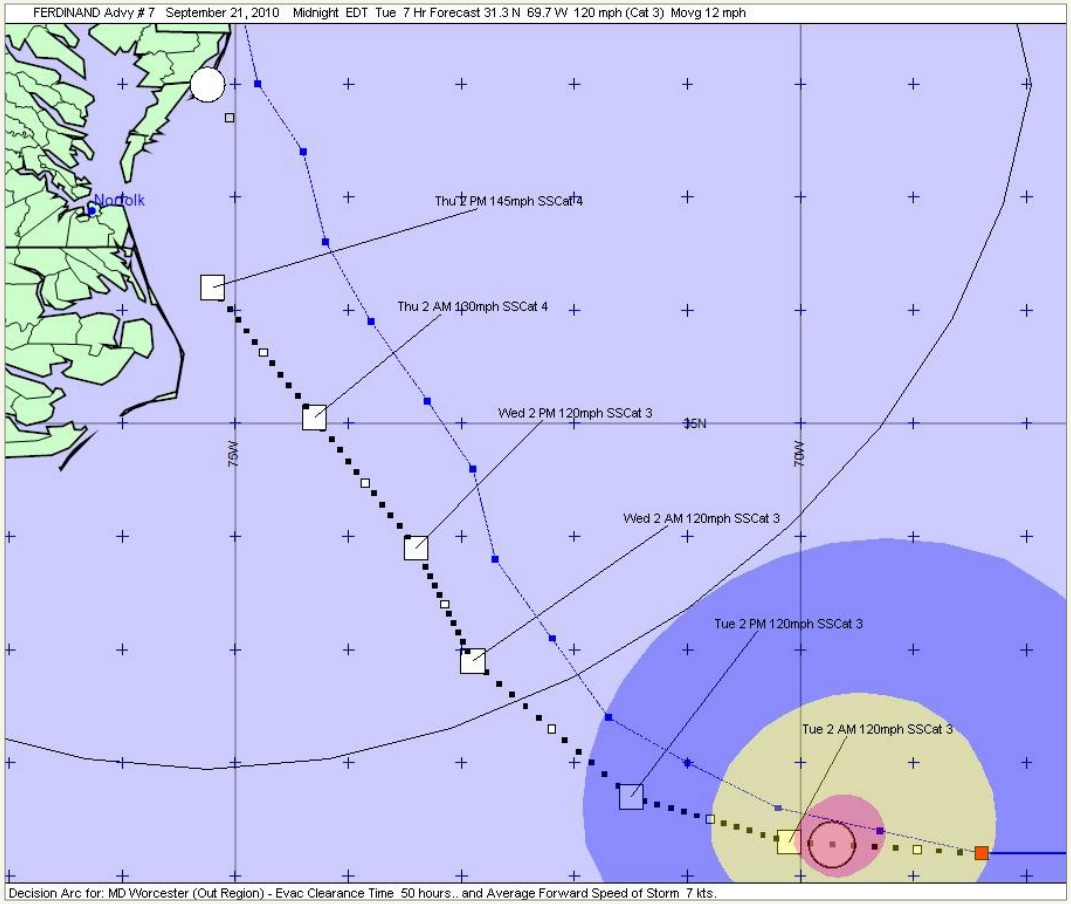
CLOSEST POINT OF APPROACH

Closest Point of Approach (CPA) Evacuation Timing Assumptions



DECISION ARC

Decision Arc
Evacuation Timing Assumptions


FERDINAND Advy # 7 September 21, 2010 Midnight EDT Tue 7 Hr Forecast 31.3 N 69.7 W 120 mph (Cat 3) Movg 12 mph
Norfolk
Thu 2 PM 145mph SSCat 4
Thu 2 AM 130mph SSCat 4
Wed 2 PM 120mph SSCat 3
Wed 2 AM 120mph SSCat 3
Tue 2 PM 120mph SSCat 3
Tue 2 AM 120mph SSCat 3
75W
70W
35N
Decision Arc for: MD Worcester (Out Region) - Evac Clearance Time 50 hours.. and Average Forward Speed of Storm 7 kts.

EXERCISE II

This participant exercise should take 10 minutes to complete

Participants will be expected to navigate ATM and integrate its results into the HURREVAC

Participants will use the ATM data to determine the timing of initiating hurricane evacuations in relation to forecast tropical storm wind arrival times

Remember - Work from the copy of the ATM saved as

UNIT 7 – CAPSTONE QUIZ

Identify the two major assumptions relative to evacuation decision timing and the approach of the storm

Use the tools in HURREVAC to determine when to start an evacuation based on the DTP assumption

Use the tools in HURREVAC to determine when to determine start an evacuation based on the CPA assumption

UNIT 7 – SUMMARY

There are two methods to determining the evacuation decision time for a community based on the ATM clearance times.

The DTP assumption relative to the storm approach provides the safest results in calculating a decision time for a community, especially if it is in the average forecast error cone.

The CPA methodology for evacuation decision making assumes that a hurricane will follow along the forecast track in an advisory.

Many of the ATM clearance times are pre-loaded into HURREVAC for use in decision making by state and local emergency management staff.

Despite the pre-loaded clearance times in HURREVAC,

Course Summary

REVIEW OF UNITS – UNIT 2

The 2007 Delmarva HES provides estimates of clearance times and includes an ATM with a Consequence Management Module

The seven steps in the evacuation modeling process include;

Step 1: Establish Evacuation Zones
Step 2: Establish Evacuation Roadway Network
Step 3: Collect Demographic and Behavioral Data
Step 4: Generate Evacuation Statistics
Step 5: Distribute Evacuation Trips
Step 6: Identify Vehicles by Roadway Segment
Step 7: Calculate Clearance Times

Clearance time is the time between when the first person leaves their home until the last person reaches their destination. It includes mobilization time, travel time and queuing time/delay. Evacuations must be

REVIEW OF UNITS – UNIT 3

The Excel-based platform is assessable and easy to use. The model provides reliable results and allows users to test different scenarios.

The six functional groupings of worksheets or modules that include;

Demographic Data Module (5 regional worksheets)
Behavioral Data Module (5 regional worksheets)
Out Route Assignment Module
Evacuation Statistics Module (5 regional worksheets)
Evacuating Vehicles Module (Vehicles by Roadway, Clearance Times)
Consequence Management Module

The clearance time table is consulted to identify the regional bottlenecks with the worst clearance times. If a significant portion of a County's evacuating traffic passes through this bottleneck based on the data in the

REVIEW OF UNITS – UNIT 4

While the three primary data entry modules; Socioeconomic, Behavioral, and Out Route Assignment, can all be modified by users, the Socioeconomic Data module includes an easy to edit table to adjust for common changes such as population growth

The Evacuating Vehicles by Focal Point/Critical Roadway Segment worksheet includes a table that allows users to adjust the service volumes on local and regional critical roadway segments

The Clearance Time worksheet includes a column that can be adjusted to account for changes in anticipated background traffic

REVIEW OF UNITS – UNIT 5

The Evacuation Statistics module includes summary information on the total number of evacuating people and vehicles for a County

Changes made in the Out Route Assignment Module also reflected in the two worksheet that make up the Evacuating Vehicles Module; the Evacuating Vehicles by Bottleneck/Critical Roadway Segment worksheet and the Clearance Times worksheet.

The least efficient (worst) clearance time at regional or local bottlenecks along a county's primary evacuation routes determines its

REVIEW OF UNITS – UNIT 6

The Consequence Management module was developed to better understand evacuation dynamic during an evacuation

The ATM includes CM worksheets for four locations;

Virginia North (US 13 / US 113 at Pocomoke City, MD)

Maryland Shore West (US 50 / US 13 Bypass near Salisbury, MD)

Maryland Tri-State West (Route 404 / US 50 near Wyes Mills, MD)

Delaware North (US 1 / US113 near Milford, DE)

The CM module includes several user defined features, including people per vehicle, primary evacuating lanes, average daily trips, and LOS D hourly volume

REVIEW OF UNITS – UNIT 7

There are two methods to determining the evacuation decision time for a community based on the ATM clearance times.

The DTP assumption relative to the storm approach provides the safest results in calculating a decision time for a community, especially if it is in the average forecast error cone.

The CPA methodology for evacuation decision making assumes that a hurricane will follow along the forecast track in an advisory.

Many of the ATM clearance times are pre-loaded into HURREVAC for use in decision making by state and local emergency management staff.

Despite the pre-loaded clearance times in HURREVAC,

PARTICIPANT OBSERVATIONS

What are your thoughts?

- Did the course meet your objectives?
- Was the course structure well?
- Do you feel prepared to use the ATM?
- Can you train others in its use?

COURSE EVALUATION

Participant observations and feedback will be collected for inclusion in a Workshop Evaluation Report

The course will be evaluated using an evaluation form that will be provided by email

Participants will complete the form and email the completed evaluation to the instructors

Instructors will prepare an evaluation report including a list of attendees, description of obstacle, keys to success and a compilation of evaluation survey results

CLOSING

Close out of the ATM application and HURREVAC

Ensure you were registered on the sign in sheet

Complete the web-based evaluation

Retain all participant course materials

Use the ATM in your emergency management planning and operations duties

Train others in its use

National Hurricane Program

FEMA